# Babine Watershed Monitoring Trust

# 2013 Annual Monitoring Plan

FINAL

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# 1. Introduction

The Babine Watershed Monitoring Trust (BWMT) is directed through its Trust Agreement Document to be responsible for "*planning, prioritising, directing, facilitating and funding impartial monitoring research of the implementation and effectiveness of public land use plans and related natural resources management activities in the Babine Watershed*"; and "*providing credible monitoring research results as part of a formal rigorous adaptive management process that enables continuous improvement of public land use plans resulting in better management of environmental values in the Babine Watershed.*"

This document constitutes the 2013 Annual Monitoring Plan (AMP) for the Babine Watershed Monitoring Trust, which the Trustees are required to produce under Section 10.2 and Schedule C of the BWMT Agreement. The first Annual Monitoring Plan was approved by the BWMT in July of 2005. Since then, AMPs have been completed annually. Each year, some planned projects have not been completed and have carried over to subsequent years for a variety of reasons. These projects remain a priority of the BWMT, and appear in subsequent AMPs.

The 2013 AMP sets out the year's budget, lists high-priority monitoring projects, describes projects approved for direct funding, and identifies topics requiring additional funding. The plan provides a synopsis and rationale for each approved project. The BWMT allocates funds to monitoring projects using the process for determining priorities and costs prescribed in the BWMT Agreement and described in the Babine Watershed Monitoring Framework (see www.babinetrust.ca).

# 2. Budget

The funds available from the Babine Watershed Monitoring Trust Revenue Trust Account (BWMT Agreement, Section 3.1.3) are set out in Table 1. The BWMT will receive a private donation by March 2013 with a total value of $30,000, and has received over $3,000 in other donations. These funds are available to directly support the 2013 AMP. There is no longer matching funding available from the provincial government. There are also funds carried over from 2012—unallocated or project surpluses.

**Table 1.** Budget for 2013.

| | Contributed | Available under the 2:1 private/public ratio rule | Funds Available to be Distributed | Banked for 2013 |
|---|---|---|---|---|
| **Revenue Trust Account** | | | | |
| Private donations expected 2013 | $30,000.00 | $30,000.00 | | |
| Donations 2012 | $3,398.35 | $3,398.35 | | |
| Received $5,000 less than expected in 2012 | -$5,000 | -$5,000 | | |
| Levered funds: 2012 | $0.00 | $0.00 | | |
| BC gov't – remaining funds | $0.00 | $0.00 | | |
| ***Revenue Trust Account Funds Available*** | | **$28,398.35** | **$28,398.35** | |
| **Other Funds** | | | | |
| Banked Funds from 2012 | | | $11,010.92 | |
| Interest Income 2012 | | | $1,066.89 | |
| Unused Funds from Previous Projects (2009-A3 $1,500; 2008-1 $2,000) | | | $3,500.00 | |
| ***Other Funds Available*** | | | **$15,577.81** | |
| ***Total Funds Available*** | | | **$43,976.16** | |
| **Expenses** | | | | |
| Administrative &Technical Support | | | ($13,400.00) | |
| New Projects 2013 (5 projects) | | | ($30,500.00) | |
| ***Total Expenses*** | | | ***($43,900.00)*** | |
| ***Funds Available minus Expenses*** | | | ***$76.16*** | ***$76.16*** |

## 3. Monitoring Priorities

The Trust supports monitoring projects, maintains the Babine Watershed Monitoring Framework and administers the monitoring program.

The Monitoring Priority Tables generated by the Monitoring Framework show priorities and associated costs for the following types of monitoring:

1. collecting indicator data (implementation monitoring),
2. monitoring to improve knowledge and reduce uncertainty (validation monitoring/research),
3. monitoring to detect negative consequences (effectiveness monitoring).

Appendix 1 summarises funding decisions for high-priority monitoring topics in each of the three types. The order within each list indicates relative priority assigned by the Monitoring Framework as updated in 2010. The tables also provide a brief rationale for each funding decision. Not all topics can be funded. Higher-priority topics will usually be funded preferentially. When a lower-priority topic is selected for funding, a rationale is provided as to why the higher-priority topics were not chosen. All non-funded topics lower on ranked lists are not funded because of insufficient funds.

The Priority Tables also note objectives that cannot be monitored because targets are lacking (Appendix 3). Government has been advised that it needs to amend land-use plans to include measurable targets so the BWMT can monitor these objectives, but progress is slow.

# 4. Approved Monitoring Projects for 2013

## *4.1 Ongoing Projects from Previous Years*

Five projects will be essentially completed by March 31, 2013, awaiting final report and presentation and invoicing (Table 2). The water quality project will continue through 2013 (Table 2).

**Table 2.** Ongoing projects from previous years (values to nearest $).

| Project Number | Title | Status | Funding Committed |
|---|---|---|---|
| 2006-3 | Wilderness Value of Babine River Corridor | Will be completed by March 31, 2013 | $13,189 |
| 2008-1 | Update Knowledge Base | Ongoing | $1,297 |
| 2009-A3 | Fundraising | Ongoing | $643 |
| 2009-3 | Grizzly Bear Habitat | Will be completed by March 31, 2013 | $3,957 |
| 2010-1 | Timing of Industrial Activities | Will be completed by March 31, 2013 | $1,055 |
| 2010-A3 | Data Management | Support to March 2013 | $4,607 |
| 2012-1 | Grizzly Bear Workshop | Will be completed by March 31, 2013 | $5,275 |
| 2012-2 | Indicator Data Summary | Will be completed by March 31, 2013 | $11,226 |
| 2012-3 | Water Quality | Phase I and II complete, Phase III to start 2013 | $21,102 |
| **Total** | | | **$61,852** |

## 4.2 New Projects

The allocation of available funds for this year is shown in Table 3. Four new monitoring projects, and one communication project, are approved for full funding by the BWMT in 2013. These projects will investigate water quality, complete a literature survey and design for a biodiversity study, develop collaborative relationship with BC Parks and design grizzly bear/human monitoring, collaborate with MFLNRO to update the monitoring framework to include objectives from Forest Stewardship Plans and Government Objectives, and update the website as part of BWMT's communication plan. Funds are also approved for ongoing administrative and technical support.

**Table 3.** Approved projects for 2013. "A" designates administrative and technical support (nearest $).

| Activity | Project Number | Title | Funding Committed | % of Total |
|---|---|---|---|---|
| New projects | 2013-1 | Water quality: stream temperature and glaciers | $20,000 | 46 |
| | 2013-2 | Biodiversity effectiveness monitoring design | $5,000 | 11 |
| | 2013-3 | Grizzly bear/human monitoring design | $2,000 | 5 |
| | 2013-4 | Update monitoring framework | $2,000 | 5 |
| | 2013-5 | Communication: update BWMT website | $1,500 | 3 |
| Project support | 2013-A1 | Technical Support | $8,400 | 19 |
| | 2013-A2 | Administrative Support | $5,000 | 11 |
| **Total** | | | **$43,900** | |

Project costs form 70% of new expenditures for 2013; support costs form the remaining 30%. Total expected expenditures for 2013 are $61,852 for ongoing projects plus $30,500 for new projects. Support costs form 15% of this combined total in 2013.

New and ongoing projects are described in the following synopses. Synopses for completed projects are included in Appendix 2 until the results have been incorporated into the Knowledge Base and included in other processes (e.g. BWMT Plan Amendment Process and Criteria), at which point the project summaries are included in a BWMT 5-year Activity Report. Subsections listing consequences for the Knowledge Base and consequences for management summarise actions precipitated by each project.

# 5. New Project Synopses 2013

## Project 2013-1: Water quality: temperature and climate change

### Abstract:

This project examines two elements of water quality: water temperature as impacted by cumulative effects of development and climate change, and impacts on hydrology related to loss of glaciers with climate change. Harvesting wet ecosystems can lead to increased stream temperature even with riparian corridors. Ditches along road networks can lead to substantially increased water temperature because the water moves slowly. The Shedin and Nilkitkwa sub-basins in particular may have concerns for temperature due to the amount of harvesting. Bull trout and spawning salmon are sensitive to temperature.

The first phase of the stream temperature element is an office exercise, overlaying road networks and harvested wet ecosystems with sensitive fish habitat, and determining priority locations for field monitoring. The second phase includes field measurements of temperature in selected road ditches linked to stream systems at mid-day in July.

The project also includes a preliminary investigation into glacier status in northern Babine systems, determining trends in glaciers and predicting risk to Babine water quality due to climate change. As ice and snow melt in spring, sediment from on top enters water system and decreases quality. As temperature increases in summer, melting from glaciers adds further input. Streams clear in fall. Small streams can be clear water refugia during high-sediment periods. An important question to consider is "what is climate change doing to the glaciers and how will changes impact water systems in the Babine". Studying present and forecast glacier condition could decrease uncertainty.

**Status:** Initiated in 2013.

**Geographic scope:** Stream temperature in Nilkitkwa and Shedin sub-basins; glacier status in Nilkitkwa and other northern Babine systems.

**Objectives listed in land-use plans:** Land-use plans include a goal to maintain water quality, but focus indicators on those dealing with sedimentation. Thus, there is uncertainty about whether achieving the objectives will achieve the goal.

**Type of monitoring:** Reducing uncertainty

**Potential leaders:** To be determined through Request for Proposal process.

**Potential partners:** Dave Wilford (hydrologist, MFLNRO) and Matt Sakals (geomorphologist MFLNRO) proposed the project as a priority for the Babine. Brian Menounos is a glacial geomorphologist at UNBC.

**Funding:** $20,000 (including GST)

**Consequence for knowledge base:** This project will gather information on important water quality indicators that are not currently included within the knowledge base and will allow an assessment of risk to water quality associated with these indicators.

**Consequence for management:** This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with strategies to maintain water quality. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2013-2: Biodiversity effectiveness monitoring design

### Abstract:

This project will review literature and propose methodology to monitor the effectiveness at maintaining biodiversity of a) stand-level retention of various structures, b) retention of natural tree species and c) landscape-level connectivity of mature and old forest in corridors. The project will list appropriate indicators (i.e. sensitive to change, easy to monitor) and provide appropriate study design.

The monitoring must be achievable within BWMT's budget (e.g. $20,000/year for two years), or must propose collaboration to increase the budget. A table of options and costs would be useful.

**Status:** Initiated in 2013.

**Geographic scope:** To be determined through the project within the Babine Watershed.

**Objectives listed in land-use plans:** Land-use plans include objectives to maintain biodiversity.

**Type of monitoring:** Design of effectiveness monitoring

**Potential leaders:** To be determined through Expression of Interest process

**Potential partners:** To be determined

**Funding:** $5,000 (including GST)

**Consequence for knowledge base:** This project will design an effectiveness monitoring project for future implementation.

**Consequence for management:** This project will suggest further monitoring projects.

## Project 2013-3: Grizzly bear/human behaviour monitoring design

### Abstract:

This project is based on recommendations from Project 2012-1 (Collaborative grizzly bear workshop).

The factors at play near Babine River Corridor Park entrance (e.g. concentration of attractants, recreational angling, food and commercial fisheries, high human density, lack of consistency in behaviour towards grizzly bears) result in high risk to bears in this area, as evidenced by the hotspot analyses in Project 2009-2. At the grizzly bear workshop, experts considered that, in the sub-unit centred on the fish fence, the risk factors are extreme and unsustainable. The most significant risk is of female mortality due to human-bear conflict. Females with cubs frequent this area. Some disappear; others are known to have been killed. Concentrated adult female mortality can lead to gaps in grizzly bear distribution. The weir area could be an attractive sink.

Experts agreed that neutral interactions between humans and grizzly bears (e.g. through well-managed bear viewing) are unlikely to translate into changed bear behaviour away from a site and hence unlikely to increase vulnerability. However, food-conditioned bears behave in ways that increase their mortality. Eliminating food conditioning could reduce the sink potential. Experts agreed that, if the weir cannot be removed, human behaviour must change. In the past 20 years, 14 bears were either killed or moved as problem wildlife (Project 2009-2). Experts consider moved bears as dead bears. Three quarters of management actions are located near Fort Babine, with an additional 22% near the fish fence (Project 2009-2). Smokehouses and garbage are particularly attractive to bears.

The behaviour of recreational anglers in relation to attractants has improved over the past few years, following implementation of more stringent regulations set by BC Parks (e.g. no fish storage, no angling near dawn and dusk). The electric fence around the DFO compound has also eliminated accessibility of attractants. However, newly accessible attractants may be associated with the cleaning of fish (particularly jacks) as part of the Babine nation commercial fishery. Good empirical data about bear movement in relation to attractants is necessary.

Experts at the workshop proposed that a bear monitoring and management officer stationed near the park entrance very day throughout the busy season could collect monitoring data as well as mitigate risk. This project will build a collaborative relationship with BC Parks to design a monitoring program (e.g. collect hair and scat for DNA analysis, monitor human behaviour and spatial and temporal patterns of use with traffic counters on roads and by access control points, trail camera, surveys of motorised and non-motorised use, stratified surveys of users). The project will propose monitoring design and cost-sharing between BWMT and BC Parks.

**Status:** Initiated in 2013, following from project 2012-1.

**Geographic scope:** Babine River Corridor Park entrance area.

**Objectives listed in land-use plans:** Objectives to maintain grizzly bears are included in all land-use plans.

**Type of monitoring:** Designing implementation and effectiveness monitoring.

**Potential leaders:** To be determined through Expression of Interest process.

**Potential partners:** BC Parks

**Funding:** $2,000 (including GST)

**Consequence for knowledge base:** This project will design a monitoring program.

**Consequence for management:** This project will suggest further monitoring projects.

## Project 2013-4: Update Monitoring Framework

### Abstract:

This project would be completed in collaboration with Glen Buhr of MFLNRO as described in communications between Glen and BWMT. The goal of the project is to strengthen the strategic-level relationship between BWMT and the District in order to take advantage of synergies, avoid duplication of efforts and generally improve the effectiveness of monitoring.

BWMT is required to monitor the results and strategies of Forest Stewardship Plans (FSPs) within the Babine River Watershed. To monitor the effectiveness of these strategies requires that they are added to the monitoring framework, and that the risk curves take into consideration implications of implementing approved FSP results and strategies within the Babine Watershed. This year's work would determine whether any of the newly included strategies are high priorities for monitoring.

**Status:** Initiated in 2013.

**Geographic scope:** Babine Watershed.

**Objectives listed in land-use plans:** All objectives listed within FSPs.

**Type of monitoring:** All types

**Project leader:** Karen Price

**Partner:** Glen Buhr (MFLNRO)

**Funding:** $2,000 (including GST). Funds taken from project 2008-1 (Update Knowledge Base).

**Consequence for knowledge base:** This project will update the framework and the knowledge base.

**Consequence for management:** This project will suggest further monitoring projects.

## Project 2013-5: Update BWMT Website

### Abstract:

This project is part of BWMT's newly-completed communications strategy. The existing website requires revision to enable easier updating of information. The project aims to improve communication with all audiences.

**Status:** Initiated in 2013.

**Geographic scope:** Babine Watershed.

**Objectives listed in land-use plans:** Not applicable.

**Type of monitoring:** All types

**Project leaders:** Taylor Bacharach

**Potential Partners:** None

**Funding:** $1,500 (including GST). Funds taken from project 2009-A4 (Funding Solicitation).

**Consequence for knowledge base:** This project will communicate the knowledge base and monitoring results.

**Consequence for management:** Increased knowledge of BWMT's work and monitoring results.

# 6. Ongoing Project Synopses

## Project 2012-1: Collaborative grizzly bear workshop

### Abstract:

This project will provide seed funding for a collaboratively-run workshop for grizzly bear and ecosystem experts. It has three objectives: to assess previous work on Babine grizzly bears, including limitations of data and knowledge gaps; to direct future monitoring activities; and to bring together groups with an interest in Babine grizzly bears. The workshop could evolve into an expansion of methods recommended in Wellwood and Pfalz (2009) to produce a conceptual cumulative effects framework.

**Status:** Initiated in 2012. Anticipated completion by March 31, 2013.

**Geographic scope:** Population of grizzly bears that use the Babine Watershed.

**Objectives listed in land-use plans:** Various under goals to maintain grizzly bears in all plans.

**Type of monitoring:** This project will assist with prioritising future monitoring.

**Contractor:** Dave Daust

**Partners:** MFLNRO and MoE through NorthWest Cumulative Effects Assessment Pilot Project.

**Funding:** $5,000 (before HST)

**Consequence for knowledge base:** This project will allow for an assessment of grizzly bear work to date in the Babine and will assist with prioritising future monitoring. Information from the workshop may allow updates of the knowledge base. The workshop will also provide a broader peer review of past work.

**Consequence for management:** This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with strategies to maintain grizzly bears. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2012-2: Indicator data summary

### Abstract:

This project will investigate data availability, through existing spatial analyses and updated data layers (e.g. vegetation resources inventory, higher-level plan spatial analyses) to address gaps in implementation data for the following indicators:

- deciduous stands—natural amounts and % of natural
- equivalent clearcut area for the Kispiox portion of the watershed
- timber salvage—% of disturbed stands salvaged
- timber growth—% of stands in old seral stage
- tree species—natural amounts and % of natural for each species
- stand structure—% retention, % of various structures.

The project will summarise analyses as they apply to the Babine, will complete new analyses if necessary, and will note cases for future work, where data remain unavailable.

**Status:** Initiated in 2012. Anticipated completion by March 31, 2013.

**Geographic scope:** Babine Watershed unless specified (i.e. ECA for Kispiox portion).

**Objectives listed in land-use plans:** Various, including deciduous stands, tree species and stand structure under the goal to maintain biodiversity, water quality, and timber salvage and growth.

**Type of monitoring:** Collecting indicator data (implementation monitoring).

**Potential leaders:** To be determined through Expression of Interest process.

**Potential partners:** To be determined.

**Funding:** $12,000 (before HST)

**Consequence for knowledge base:** This project will collect indicator data for several objectives with missing information to facilitate risk analysis for these objectives.

**Consequence for management:** This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with strategies to maintain objectives. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2012-3: Water quality

### Abstract:

This project has three phases, with each phase being dependent upon successful completion of previous phases:

- Phase I gathered information. Because land-use plans focus on sedimentation rather than including, for example, stream temperature or point-source chemical contamination, there is uncertainty about whether the indicators included in the plans will maintain water quality. This phase confirmed that BWMT can monitor indicators not currently listed in land-use plans, investigated existing information, and determined priorities for a more comprehensive list of indicators of water quality, based on a meeting with Dave Wilford and Matt Sakals. One priority (looking at sedimentation issues at road crossings) will be covered by Project 2012-3; another will be included in new project 2013-1.
- Phase II selected two priority sub-basins—Gail and Shedin—for examining road crossings. Gail Creek has potential issues, including slumps and unpulled culverts, at road crossings. Gentle over steep terrain is common. Shedin has an alluvial fan with erosional issues.
- Phase III will use a Stream Crossing Quality Indicator to assess the hazard of sedimentation to water quality in Gail and Shedin sub-basins. This project repeats the sampling completed for sub-basins in the Bulkley. The Kispiox portion of the Babine has more relief, and more fragile sediments, than the sub-basins BWMT has previously studied.

**Status:** Initiated in 2012. Phases I and II completed. Phase III initiated in 2013.

**Geographic scope:** Gail and Shedin sub-basins.

**Objectives listed in land-use plans:** Land-use plans include a goal to maintain water quality, and focus on sedimentation indicators.

**Type of monitoring:** Reducing uncertainty

**Potential leaders:** To be determined through Request for Proposal process for Phase III.

**Potential partners:** Dave Wilford (hydrologist, MFLNRO), Glen Buhr (District Stewardship MFLNRO), Al Harrison (engineering technician for BCTS in Hazelton)

**Funding:** $20,000 (before HST) for all three phases.

**Consequence for knowledge base:** Phase I will determine appropriate water quality indicators. Phases II and III will gather information on a priority indicator.

**Consequence for management:** This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with strategies to maintain water quality. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2010-1: Industrial Activity Timing

**Abstract:**

This project will collect information on the timing of industrial activities in relation to mountain goats, grizzly bears and recreation. Industrial activities investigated will include all stages of forest management, including road building, harvesting and silviculture, as well and mining and exploration.

For mountain goats, the project will determine the proportion of industrial activities within 200 m and 500 m of goat habitat during the natal period (April 15 – July 15). It will also determine activities in this zone during winter (October to March), because Project 2008-3 noted that winter activity should also be an indicator. For minimising disruption to grizzly bears, hibernation is the timing variable of interest. Because bears are active throughout October, the project will determine the proportion of industrial activity in mapped grizzly bear zones from November to March. For wilderness value, the project will determine the proportion of industrial activity within the Babine River Special Management Zone from November to March (winter) and from August to October (peak tourism period).

This project will query existing databases (e.g. RESULTS), and interview knowledgeable people as necessary.

**Status:** Initiated in 2010. Anticipated completion by March 31, 2013.

**Geographic scope:** Babine watershed.

**Objectives listed in land-use plans:** The Bulkley LUPs have a strategy to avoid harvesting near mountain goat habitat during the natal period. The Kispiox SRMP and Babine LUP have strategies to harvest during winter in various zones to minimise disruption to grizzly bears and to maintain wilderness value in Babine River Corridor Park. Bulkley LUPs have strategies to harvest in winter to protect connectivity in landscape riparian corridors.

**Type of monitoring:** Collecting implementation data.

**Contractors:** Deborah Cichowski and Johanna Pfalz

**Potential partners:** PIR may be able to provide in-kind assistance.

**Funding:** $4,000 (before HST)

**Consequence for knowledge base:** This project will collect implementation data to allow for risk assessment.

**Consequence for management:** This project will enable better management decisions to be made, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current timing of industrial activities. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2010-A3: Data Management

**Abstract:**

This project will develop and implement a process to gather, maintain and access spatial information. Funding covers hardware and fees for a Data Administrator to complete the following tasks:

- provide the necessary hardware,
- develop an appropriate data management model,
- document standards for GIS data for use with BWMT projects,
- locate and load existing BWMT data from previous years, and
- load data from projects completed this year.

The project is based on the description of Phase I presented to the BWMT, as requested, by Johanna Pfalz in October, 2009.

**Status:** Initiated in 2010; contract let 2011. Continuing to March 31, 2014.

**Geographic scope:** Babine watershed.

**Objectives listed in land-use plans:** Not applicable

**Type of monitoring:** All

**Contractor:** Johanna Pfalz

**Potential partners:** Consideration of partners will occur in future Phases.

**Funding:** $2,690 for set-up and loading existing data. A maximum of $3,310 further will be available for ongoing administration over the year (it is anticipated that this cost will be lower than projected). Total budget: $6,000 (before HST). Budget to continue project: additional $3,000 (before HST).

**Consequence for knowledge base:** This project will track spatial data for BWMT projects, increasing efficiency for future projects and facilitating updates.

**Consequence for management:** Not applicable.

## Project 2005-4 / 2006-3: Wilderness Value of Babine River Corridor

**Abstract:**

This project has three phases, two of which will be supported by funds released in 2011.

Phase 1 will explore methodologies, including new approaches based on social networking, that can be used to assess public perception of wilderness value and socially acceptable levels of sustainable use in a non-biased manner.

Phase II will develop a specific approach for the Babine River Corridor, targeted at the complete suite of interest groups. The approach must be able to consider sustainable use in the Natural Environment and Wilderness Recreation Zones of Babine River Corridor Park, and must also investigate perceptions of auditory disturbance throughout the Park. Initiation of Phase II is dependent upon approval of Phase I by BWMT Trustees.

Phase III, for future potential funding dependent upon successful completion of Phase II, will implement the approach.

**Status:** Initial methodology designed in 2005/2006, but did not meet the requirements of the BWMT. Funding was deferred to allow completion and implementation of the Babine River Corridor Management Plan by BC Parks, of the Quality Waters Strategy and Angling Management Plan and a subsequent risk analysis of new strategies. Park Management Plan will now not be completed in the foreseeable future; hence funds released for Phase I in 2011. Phase I and II anticipated completion by March 31, 2013.

**Geographic scope:** Babine River Corridor Park

**Objectives listed in land-use plans:** The Babine River Corridor Park Management Direction Statement includes an objective to maintain a wilderness experience in the corridor, including a sustainable level of recreation. The Kispiox SRMP includes an objective to maintain the aesthetic quality (visual and auditory) of the Babine River Corridor.

**Type of monitoring:** Detecting negative consequences (sustainable use); reducing uncertainty (auditory disturbance).

**Contractor:** Megan D'Arcy and Ruth Lloyd (2012). John Shultis, University of Northern BC (2005).

**Partners:** 2005 phase: Real Estate Foundation Partnering Fund (provided matching funds; 2005), ILMB (provided logistic support).

**Potential partners:** BC Parks (Brandin Schultz) current phase.

**Funding:** $5,000 in 2005 (completed); $15,000 (before HST) budgeted in 2006, deferred to future years. $5,000 (before HST) of the $15,000 will be released for Phases I and II in 2011.

**Consequence for knowledge base:** This project constitutes the first step in detecting negative consequences to sustainable use and wilderness value of the Babine River Corridor.

**Consequence for management:** This project will enable better management decisions to be made, through appropriate processes which are separate from the BWMT, by determining levels of sustainable use in various zones of Babine River Corridor Park. It may increase confidence in current activities, suggest further monitoring projects or provide input to further development of strategies in Babine River Corridor Park, through amendment of the Management Direction Statement or eventual development of a full Park Management Plan.

# 7. Administration

## Project 2013-A1: Technical support

**Abstract:**

Continuity of technical support is necessary for effective and efficient management of the monitoring framework, and the BWMT in general. Karen Price will provide technical support to the BV Research Centre and the BWMT as needed. Tasks include

- advise BWMT as necessary on Monitoring Framework
- prepare agenda, facilitate meetings and provide minutes
- communicate with BV Research Centre
- present monitoring priorities (as resulting from Monitoring Framework) to BWMT
    - provide initial description of projects and cost estimates
    - facilitate discussion in relation to project selection
- write draft AMP and revise based on BWMT comments
- liaise with contractors to ensure that projects meet needs of framework and BWMT
    - meet to confirm project design
    - discuss project as necessary
    - review and edit report
    - supervise summary of study to ensure that it allows Knowledge Base to be updated, and describes consequences for the Knowledge Base, for management and for future monitoring
- communicate project status to BWMT as necessary

**Status:** Initiated in 2007; division between administration and technical support revised in 2009 and 2010. Administered by Bulkley Valley Research Centre.

**Geographic scope:** Not applicable

**Objectives listed in land-use plans:** Not applicable

**Type of monitoring:** Not applicable

**Contractor:** Karen Price

**Potential partners:** Bulkley Valley Research Centre

**Funding:** $8,400 (including GST)

**Consequence for knowledge base:** Not applicable

**Consequence for management:** Not applicable

## Project 2013-A2: Administrative Support

**Abstract:**

The Bulkley Valley Research Centre provides administrative support in the form of contract management, meeting facilities and support, website maintenance, and communications. Tasks include

- maintain independent financial records
- manage contracts
    - prepare calls for proposals
    - select contractor
    - prepare and implement contract
    - oversee contracts to ensure quality and timeliness of reporting
- add documents to website.

Please see contract schedules for further information.

**Status:** Ongoing since 2005; division between technical support and administration revised 2009 and 2010.

**Geographic scope:** Not applicable

**Objectives listed in land-use plans:** Not applicable

**Type of monitoring:** Not applicable

**Contractor:** Bulkley Valley Research Centre

**Funding:** $5,000.00. Taxes are not charged.

**Consequence for knowledge base:** Not applicable

**Consequence for management:** Not applicable

## Project 2009-A3: Funding Solicitation

**Abstract:**

The BWMT needs to broaden its funding base, especially if existing sources of private and government funds decline.

BWMT developed a communications strategy in 2013. The BWMT brochure and poster are important elements of this strategy. Funds will be taken from this pool to create a poster (Project 2013-5) and print and distribution another 500 brochures.

**Status:** Initiated 2008.

**Geographic scope:** Not applicable

**Objectives listed in land-use plans:** Not applicable

**Type of monitoring:** Not applicable

**Contractor:** To be determined in consultation with Bulkley Valley Research Centre

**Potential partners:** Bulkley Valley Research Centre, Government ministries (particularly MFLNRO and MoE)

**Funding:** $2,000 (2009); $1,250 (2008); total $3,250 (before HST)

**Consequence for knowledge base:** Not applicable

**Consequence for management:** Not applicable

# Appendix 1: Decision Tables

Appendix 1 summarises funding decisions for high-priority topics in three types of monitoring:

- Table A1 (p. 21) **Collect Indicator Data** (Implementation Monitoring)
- Table A2 (p. 23) **Improve Knowledge and Reduce Uncertainty** (Validation Monitoring/Research)
- Table A3 (p. 24) **Detect Negative Consequences** (Effectiveness Monitoring).

**Table A 1 Collect Indicator Data** (Implementation Monitoring).

Funding decisions for high priority topics for collecting indicator data. Topics for this 5-year period are ordered by relative priority as determined by Monitoring Framework[4]. Shaded projects are completed, ongoing or planned for 2012.

| Objective | Indicator | History | Project # | Project name | Funding | Project length | 2012 Status | Rationale |
|---|---|---|---|---|---|---|---|---|
| Fish habitat | % of natural riparian habitat | Funded 2005 | 2005-1 | Riparian ecosystems | $15,000 | 1 year | Complete for Nichyeskwa. | Low priority in other watersheds |
| Riparian biodiversity | % of natural riparian habitat | Funded 2005 | 2005-1 | Riparian ecosystems | as above | 1 year | Complete for Nichyeskwa. | As above |
| Rare ecosystems | % of natural | Funded 2009, 2010 | 2009-1 | Rare ecosystems: phase I and II | $10,551 | 2 years | Initiated 2009 | |
| Steelhead | Repeated capture | Not funded | — | — | — | — | — | Too expensive to do well |
| Human/bear interaction | Screening | Not funded | — | — | — | — | — | Will be assessed during grizzly workshop (2012-1). |
| Human/bear interaction | Education | Funded 2009 | 2009-2 | Human/grizzly bear interaction and education: baseline data | $10,551 | 1 year for baseline | Initiated 2011 | |
| Water quality | Stream crossing: Kispiox | Assessment funded 2012 | 2012-3 | Water quality | $21,102 (part) | — | Will be assessed | Will be assessed in water quality project (2012-3) |
| Water quality | Landslides | Assessment funded 2012 | 2008-1 (part); 2012-3 | Water quality | $250 in 2008; $21,102(part) in 2012 | — | Will be assessed | Will be assessed in water quality project (2012-3) |
| Deciduous stands | % of natural | Funded 2012 | 2012-2 | Indicator data summary | $12,612 (part) | 1 year | Initiated 2012 | |

[4] Ordered by secondary score (all topics have high priority for data collection; see Monitoring Framework for methods www.babinetrust.ca).

| Objective | Indicator | History | Project # | Project name | Funding | Project length | 2012 Status | Rationale |
|---|---|---|---|---|---|---|---|---|
| Water quantity | ECA Kispiox | Funded 2012 | 2012-2 | Indicator data summary | $12,612 (part) | 1 year | Initiated 2012 | |
| Connectivity | Winter logging | Funded 2010 | 2010-1 | Industrial Activity Timing | $4,220 | 1 year | Initiated 2010 | |
| Mountain goats | harvest during natal period | Funded 2010 | 2010-1 | Industrial Activity Timing | as above | 1 year | Initiated 2010 | |
| Timber salvage | % salvaged | Funded 2012 | 2012-2 | Indicator data summary | $12,612 (part) | 1 year | Initiated 2012 | |
| Backcountry recreation | Amount primitive | Funded 2010 | 2010-2 | Recreation Opportunity Spectrum | $5,276 | 1 year | Completed 2011 | |
| Gunanoot Lake | Visual quality | Not funded | — | — | — | — | — | |
| Grizzly bears | harvesting in bear units | Funded 2009 | 2009-3 | Grizzly Bear Habitat | $10,250 | 1 year | Completed 2010 | |
| Pine mushroom habitat | % mature sites | Funded 2011 | 2011-1 | Non-timber Forest Products | $4220.40 | 1 year scoping | Initiated 2011 | |
| Huckleberries | % sunlight in cutblocks | Funded 2011 | 2011-1 | Non-timber Forest Products | $4220.40 | 1 year scoping | Initiated 2011 | |
| Huckleberries | % soil disturbance | Funded 2011 | 2011-1 | Non-timber Forest Products | $4220.40 | 1 year scoping | Initiated 2011 | |
| Timber growth | % old stands | Funded 2012 | 2012-2 | Indicator data summary | $12,612 (part) | 1 year | Initiated 2012 | |
| Access to recreation | Inaccessible destinations | Funded 2010 | 2010-2 | Recreation Opportunity Spectrum | as above | 1 year | Completed 2011 | |

**Table A 2. Improve Knowledge and Reduce Uncertainty** (Validation Monitoring/Research).

Funding decisions for high-priority topics for monitoring to improve knowledge and reduce uncertainty. Topics are ordered by relative priority as determined by Monitoring Framework[6]. Shaded projects are completed, ongoing or planned for 2012.

| Objective | Indicator | History | Project # | Project name | Funding | Project length | 2012 Status | Rationale |
|---|---|---|---|---|---|---|---|---|
| Human/bear interaction | open road density Hanawald and Shedin | Indicator data funded 2007; assessment funded 2012 | 2012-1 | Collaborative grizzly bear workshop | $5,000 | 1 year | Initiated 2012 | Will be assessed in grizzly bear workshop |
| Tree species | % of natural | Funded 2012 | 2012-2 | Indicator data summary | $12,612 (part) | 1 year | Initiated 2012 | |
| Core areas | % alteration | Funded 2011 | 2011-2 | Ecosystem network and natural disturbance | Phase I: $2,110.20; Phase II: $21,102 | 1 year | Initiated 2011 | |
| Connectivity | % of mature and old in corridors | Funded 2011 | 2011-2 | Ecosystem network and natural disturbance | Phase I: $2,110.20; Phase II: $21,102 | 1 year | Initiated 2011 | |
| Grizzly habitat | % high-value | Funded 2009 | 2009-3 | Grizzly bear habitat | $10,250 | 1 year | Completed 2010 | |
| Goat habitat | % unmodified nearby (Gail Ck) | Indicator data funded 2008 | — | — | — | — | — | |
| Goat habitat | Harvest during natal period | Funded 2010 | 2010-1 | Industrial Activity Timing | $4,220.40 | 1 year | Initiated 2010 | |
| Wilderness value of BRC | Auditory disturbance | Funded 2005; funded 2011; portion deferred | 2005-4, 2006-3 | Wilderness value of BRC | $5,000 in 2005; $15,000 deferred; $5,275.50 released 2011 | 2 – 3 years | Re-initiated 2011 | |
| Wilderness value of BRC | Visual quality | Funded 2008; Collaboration with MoFR | 2008-5 | Visual quality of Babine River | $5,000 BWMT; MoFR $12,000 | 1 year | Completed 2010 | |

[6] Ordered by priority to reduce uncertainty and then by secondary score (see Monitoring Framework for methods www.babinetrust.ca).

**Table A 3. Detect Negative Consequences** (Effectiveness Monitoring).

Funding decisions for high-priority topics for monitoring to detect negative consequences. Topics are ordered by relative priority as determined by Monitoring Framework[7]. Shaded projects are completed, ongoing or planned for 2012.

| Objective | Indicator | History | Project # | Project name | Funding | Project length | 2012 Status | Rationale |
|---|---|---|---|---|---|---|---|---|
| Sustainable use | Encounters in Natural Environment Zone | Funded 2005, 2007; deferred to 2011 | 2005-4 2006-3 | Wilderness value of BRC | $5,000 in 2005; $15,000 deferred; $5,275.50 released 2011 | 2 years | Re-initiated 2011 | |
| Stand structure | % retention; % various structures (Nichyeskwa) | Indicator data funded 2007 | — | — | — | — | — | Wait for completion of project 2011-2 |
| Tree species | % of natural | Not funded | — | — | — | — | — | Wait for completion of project 2012-2 |
| Human/bear interaction | road density Hanawald, Shedin | Assessment funded in 2012 | 2012-1 | Collaborative grizzly bear workshop | $5,275.50 | 1 year | Assessment in 2012 | Will be assessed in project 2012-1 |
| Timber salvage | % controlled | Not funded | — | — | — | — | — | Wait for completion of project 2012-2 |
| Goat habitat | % unmodified nearby (Gail) | Indicator data funded 2008 | — | — | — | — | — | |
| Goat habitat | Harvest during natal period | Funded 2010 | 2010-1 | Industrial Activity Timing | $4,100 | 1 year | Initiated 2010 | |
| Timber salvage | % susceptible | Investigation funded 2008 | 2008-1 (part) | Update Knowledge Base | $1,105 | 1 year | Needs further work | Wait for completion of project 2012-2 |
| Connectivity | % mature and old in corridors | Not funded | — | — | — | — | — | Wait for completion of project 2011-2 |
| Wilderness value of BRC | Auditory disturbance | Funded 2005, 2007; deferred to 2011 | 2005-4 2006-3 | Wilderness value of BRC | $5,000 in 2005; $15,000 deferred; $5,275.50 released 2011 | 2 years | Re-initiated 2011 | |
| Sustainable use | Floatcraft encounters | Funded 2005, 2007; deferred to 2011 | 2005-4 2006-3 | Wilderness value of BRC | $5,000 in 2005; $15,000 deferred; $5,275.50 released 2011 | 2 years | Re-initiated 2011 | |

[7] Ordered by priority to detect consequences and then by secondary score (see Monitoring Framework for methods www.babinetrust.ca).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Wilderness value of BRC | Visual quality | Funded 2008; Collaboration with MoFR | 2008-5 | Visual quality of Babine River | $5,000 BWMT; MoFR $12,000 | 1 year | Completed 2010 |

# Appendix 2: Completed monitoring projects

Synopses of completed monitoring projects are included in the Annual Monitoring Plan until the results are incorporated into the Knowledge Base and included in other processes as appropriate (e.g. BWMT Plan Amendment Process and Criteria). Subsections listing consequences for the Knowledge Base, consequences for management and recommendations for monitoring summarise actions precipitated by each project.

Projects completed prior to 2010 have been incorporated into the Knowledge Base. Synopses of these projects are listed in the 5-year Activity Report that is available at www.babinetrust.ca.

## Project 2011-1: Non-timber Forest Resources

### Abstract:

This project summarised the current indicator data for pine mushroom and huckleberry habitat in the Babine watershed based on existing mapping of mushroom areas, predictive ecosystem mapping (PEM), vegetation resources inventory (VRI), vegetation plots and information from First Nations on berry gathering areas.

At least three quarters of mapped mushroom sites are greater than 80 years of age, which is well above the 60% objective described in the SRMP. No logging has occurred within the pine mushroom habitat areas since the SRMP was implemented in 2004. The areas are relatively remote and the wood is of low value, hence threat is low. Impacts of mountain pine beetle are expected to be low. Risk to pine mushroom habitat overall is currently low.

The study developed a rough model for black huckleberry habitat potential using PEM, VRI and huckleberry prominence data for the berry management areas and the Babine watershed as a whole. Adding elevation, slope and aspect could improve the model. Berry habitat occurs within a matrix of other habitat types within the mapped berry management areas. These berry management areas have not been disturbed within the past 80 years, so that opening that were previously maintained by fire by Gitxsan people have become overgrown with vegetation that competes with black huckleberry for light and results in declining berry productivity. Only 18% of the mapped berry management areas appear to have sufficient sunlight for optimal berry production, and only a portion of these will actually produce good crops because of many other influential factors.

Pine mushrooms and huckleberries are both important cultural resources. If further work is appropriate, this project will design a process to involve people with an interest in the resources.

**Status:** Initiated in 2011. Completed 2012.

**Geographic scope:** Kispiox portion of Babine watershed.

**Objectives listed in land-use plans:** The Kispiox SRMP includes an objective to maintain high-value pine mushroom sites and to maintain or enhance the productivity of berry habitat within berry management areas.

**Type of monitoring:** Collecting implementation monitoring data

**Contractor:** Larry McCulloch

**Funding:** $4,000 (before HST)

**Consequence for knowledge base:** This project collected indicator data on pine mushroom and huckleberry habitat. Risk to pine mushroom habitat is currently low, but the capacity of black huckleberry habitat is declining due to vegetative competition and lack of disturbance.

**Consequence for management:** This project will support management decisions, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with strategies to maintain pine mushroom and berry habitat. Current strategies for maintaining pine mushroom habitat are adequate. Improving the state of berry habitat requires collaboration and prescribed burning.

## Project 2011-2: Ecosystem Network and Natural Disturbance

**Abstract:**

This study evaluated the impacts of mountain pine beetle and associated logging in the ecosystem network against indicators of biodiversity including the extent and size of logged areas, changes in the proportion of mature and old forest, road levels, connectivity/interior forest condition, and disturbance of sensitive ecosystems. In general, risk for these indicators is low on the Kispiox side of the watershed because there is less pine there, and less harvesting and road construction has occurred in recent years. There is also relatively low risk in core ecosystems throughout the watershed because pine is the leading species on only about 5% of the area in the core. Within Landscape Riparian Corridors (LRC), pine is the leading species on 4% to 14% of the area (Kispiox and Bulkley respectively) and susceptible pine stands (>10% pine greater than 40 years old) occupy about 16% of the ecosystem network. It is a significant component of many stands in localized areas, however, particularly in the SBSmc2 on the Bulkley side of the watershed, where it is the leading species on about 27% of the LRC and in the special management zone surrounding Babine River Corridor park where 13% of the zone is more than two thirds pine.

Mountain pine beetles, in the absence of logging, create conditions that are less like *forest interior* with fewer mature trees and less overstory cover. They also lead to more structure in terms of snag levels, coarse woody debris, and understory vegetation. Impacts become more significant when beetle-affected areas are logged. Stand structure in clearcut areas is usually substantially different than that in unlogged beetle affected areas.

To date, 206 ha (<1% of core ecosystems) and 1280 ha (~3% of LRC ecosystems) have been logged. There are 37 openings bigger than 10 ha within the ecosystem network. If all stands that are currently greater than 60 years old with more than 33% pine are attacked by pine beetle, an additional 1910 ha in core ecosystems and 4086 ha in LRC ecosystems will be affected. Even with aggressive assumptions on pine beetle impacts like these, 86% of core ecosystems and 77% of the LRC will be mature or old forest. The risk to biodiversity in the SBSmc2 portion of the ecosystem network, however, would be substantially greater, with only 67% of the Core and 63% of LRC in mature or old forest. Within the SBSmc2, if all susceptible pine stands are attacked and subsequently logged, the target threshold for 70% of structure and function would not be met. If they were attacked but were not logged, field data indicate that considerable structure will be retained but the number of large live trees and future snag and coarse woody debris recruitment might be compromised.

The potential impact of roads may be more significant than beetle attack or cutblocks. Land use plan objectives respecting roads are to avoid any in core ecosystems and to ensure that access into the landscape riparian corridors is temporary unless no other alternative is reasonable, yet there is considerable road development within the ecosystem network totalling ~140 km. There are 14 km of road through mature or old forest within Core ecosystems and an additional 50 km through mature or old forest within LRC ecosystems

While there are no measurable criteria in the land use plans describing acceptable level of road development in the ecosystem network, the level of road development to date seems inconsistent with the intent in the original land use plans. Densities of 0.41 km/km$^2$ in the Bulkley LRC approach a level that raises a red flag. There is uncertainty about road status.

Cutblocks also influence habitat fragmentation. Habitat connectivity and the maintenance of interior forest condition is an objective in all the land use plans. There are 28 places where cutblocks within the LRC have created a condition where the landscape corridor itself is less than 500 m wide, potentially resulting in little or no interior forest condition totalling 31 km of corridor. This metric indicates that there are areas in which the corridor itself is unlikely to provide the attributes necessary for full ecosystem function and the maintenance of biodiversity as it is defined in the land use plans. Currently, mature or old forest exists outside

the corridor adjacent to many of these sections thus reducing the degree to which ecosystem function is potentially impaired.

Risk to rare or sensitive ecosystems is low. These ecosystems generally have low levels of pine and/or low commercial timber value.

In summary, threshold levels for biodiversity indicators in the ecosystem network of the Babine Watershed, as they are defined in the land use plans, have been exceeded as a result of the cumulative impacts of mountain pine beetle and timber harvesting that may be associated with it, in a number of ways:

- limited logging has occurred in core ecosystems.
- limited road construction has occurred in core ecosystems.
- substantial road development, some of which appears to be permanent, has occurred in the LRC.
- just under 70% of mature structure and function has been maintained in the SBSmc2 portion of the LRC, with this potentially dropping to 63% with future beetle impacts.
- limited areas greater than 3.0 ha in size have been logged in the LRC.
- sections of the ecosystem network are not wide enough (< 500m) to maintain interior forest condition.

The majority of these deficiencies will have relatively low impact on ecosystem function because they are limited in extent. Disturbance in the SBSmc2, however, is approaching or exceeding threshold levels on a larger scale. Future planning should provide a hedge against uncertainty by finding ways to avoid new permanent road construction in the network and to avoid clearcut harvesting in sections of the network which are close to the 70% threshold for mature structure and function. This is especially important where opportunities to replace the existing network with other areas with the same functional attributes are limited.

**Status:** Initiated in 2011. Completed 2012.

**Geographic scope:** Babine Watershed.

**Objectives listed in land-use plans:** Land-use plans include objectives to maintain core ecosystems and to maintain the function of landscape corridors. Ecosystem networks (core areas and landscape riparian corridors) are essentially a strategy for achieving other objectives. Objectives for landscape corridors include maintaining the connectivity of mature and old forest (Kispiox SRMP Table 2) and retaining most of the structure and function associated with old forest (Bulkley Landscape Unit Plans).

**Type of monitoring:** Reducing uncertainty and collecting baseline data

**Contractor:** Larry McCulloch

**Potential partners:** Glen Buhr, MoFR; Dave Ripmeester, PIR (Collaborative HLP Objective Spatial Analysis Project)

**Funding:** Phase I: $2,000 (before HST); Phase II: $20,000 (before HST)

**Consequence for knowledge base:** This project determined that current risk to biodiversity and ecological function in core ecosystems and most LRCs due to pine beetles and logging is low, except in SBSmc2 ecosystems. Risk due to roads is higher, approaching high in some areas.

**Consequence for management:** This project will enable better management decisions to be made, through appropriate processes which are separate from the BWMT, by reducing the level of uncertainty associated with the status of the ecosystem network. It increases confidence in current strategies for logging, but suggests further consideration is necessary in relation to roads. It also suggests that flexibility in corridors would be useful to adjust for harvesting and maintain a minimum width of 600m.

## Project 2009-1: Rare Ecosystems Phase I and II

**Abstract:**

This project identified and mapped known occurrences of rare ecosystems in the Babine Watershed from one rare ecosystem survey, the Ministry of Forests BEC plot database, five terrestrial ecosystem mapping (TEM) projects, one predictive ecosystem mapping (PEM) model accuracy study, and two PEM projects. It compared data sources in terms of reliability and quality, and made recommendations about how to address knowledge gaps. About 70% of the watershed has been mapped using TEM, and the entire watershed has been mapped by PEM. However, only 2% of the area has been studied with appropriate survey intensity.

The reliability and quality of the data varies among mapping projects. For some projects there is certainty in the reported occurrences of rare ecosystems, while for other projects it is only possible to suggest sites that may support rare ecosystems. Existing TEM projects have been primarily designed to address wildlife concerns and the resulting data are insufficient for evaluating rare ecosystems. TEM mapping with high sampling intensity can help guide ground-truthed verifications of potential rare ecosystems. PEM is inadequate to provide reliable information about occurrences of rare ecosystems in the Babine watershed due to accuracy and resolution issues with the models. PEM may be useful for highlighting areas with the potential for supporting rare ecosystems.

Reliable reports have identified 25 occurrences of eight blue-listed ecosystems and 21 occurrences of seven regionally-rare ecosystems in the Babine watershed (Tables 1 and 2). This list excludes interpreted and predicted ecosystems. The small number of rare ecosystems reported likely reflects a low effort to document rare ecosystems in the area.

Table 1. Confirmed occurrences of rare ecosystems in the Babine watershed.

| Ecosystem | Biogeoclimatic unit | Occurrences |
|---|---|---|
| Western hemlock – lodgepole pine – kinnikinnick – Cladonia lichens | ICHmc1/02<br>ICHmc2/02 | 3 |
| Hybrid white spruce – paper birch – devil's club | ICHmc2/54 | 5 |
| Black cottonwood – red osier dogwood floodplain | ICHmc1/Fm02 or ICHmc1/05 or ICHmc2/Fm02 or ICHmc2/06 | 5 |
| Black cottonwood – hybrid spruce – red osier dogwood | SBSmc2/Fm02 | 4 |
| Drummond's willow – blue-joint reedgrass | SBSmc2/Fl05 | 1 |
| Scrub birch – water sedge | SBSmc2/Wf02 | 2 |
| Shore sedge – buck bean – hook moss fen | SBSmc2/Wf08 | 2 |
| Lodgepole pine – few flowered | SBSmc2/Wb10 | 3 |

| Table 1. Confirmed occurrences of rare ecosystems in the Babine watershed. | | |
|---|---|---|
| Ecosystem | Biogeoclimatic unit | Occurrences |
| sedge - Sphagnum | | |

| Table 2. Confirmed occurrences of regionally-rare ecosystems in the Babine watershed. | | |
|---|---|---|
| Ecosystem | Biogeoclimatic unit | Occurrences |
| Subalpine fir – lodgepole pine – juniper – Cladonia lichens | ESSFmc/02<br>ESSFmcp/02<br>ESSFmcw/02 | 5 |
| Subalpine fir – lodgepole pine – Cladonia lichens | ESSF wv/02 | 1 |
| Black spruce – lodgepole pine - feathermoss | SBSmc2/03 | 3 |
| Trembling aspen – paper birch- hazelnut – red osier (birch dominated of frequent fires) | ICHmc2/52<br>ICHmc2/53 | 8 |
| Western redcedar- hybrid spruce – horsetail – skunk cabbage | ICHmc2/07 | 1 |
| Fluvial Ranunculus meadows | SBSmc2/ESSFmc | 2 |
| Mesic cow parsnip meadows | ICHmc2 | 1* |

*This ecosystem has anthropogenic causes.

The study found several knowledge gaps. Overall, ecologists know very little about the status of non-forested ecosystems and rare phases of more common forested ecosystems in the Babine watershed. These unclassified ecosystems may be very rare, declining and experiencing threats, but there is no information available to assess them. Currently, a system for classifying non-forested ecosystems is being developed for BC, though only broad site classes have been described to date. It will take time to classify all non-forested ecosystems in sufficient detail to assess conservation status.

Additional surveys will be needed to meet the management objective of maintaining rare ecosystems because existing data on the types, numbers, locations and extents of rare ecosystems of the Babine watershed are insufficient and greatly under-represent the area's true diversity. A priority approach to field surveys could be developed to help direct plans for field surveys with a modest budget. High priority areas for further inventory include alpine and subalpine ecosystems, upland shrub ecosystems, and avalanche tracks. These ecosystems are key features of the Babine watershed and have received very little attention to date. Additionally, there needs to be a mechanism in place to highlight rare versions of common site series, even of very common forested ecosystems (e.g. antique forests).

With the information summarized from all available sources, there are insufficient data to determine whether objectives to maintain rare ecosystems are being met. However, it is possible to assess implementation of the reliably-

identified rare ecosystems. There are 22 listed or regionally rare ecosystems in the Bulkley TSA portion of the watershed. Six of these occurrences occur in areas of conservation, representing 27% of the known occurrences. This level of conservation potentially poses high risk to rare ecosystems.

**Status:** Phase I initiated in 2009. Phase II initiated in 2010 and combined for efficiency. Completed 2012.

**Geographic scope:** Babine watershed.

**Objectives listed in land-use plans:** The Kispiox SRMP and Bulkley LUPs include objectives for maintaining rare ecosystems.

**Type of monitoring:** Collecting implementation data

**Contractors:** Patrick Williston and Paula Bartemucci, Gentian Botanical Research

**Potential partners:** Allen Banner, Sybille Haeussler, MoFR

**Funding:** $3,000 in 2009; $7,000 in 2010; Total: $10,000 (before HST).

**Consequence for knowledge base:** This project collected indicator data on rare ecosystems to facilitate risk analysis and provided priorities for future monitoring. The project found that uncertainty remains high and that further inventory is necessary.

**Consequence for management:** This project found that further inventory is necessary to allow full monitoring of rare ecosystems. For the sub-set of reliably identified ecosystems within the Bulkley TSA, risk is potentially high. These results will be passed on to other organisations, through appropriate processes which are separate from the BWMT.

## Project 2009-2: Human/grizzly Bear Interactions and Education: Baseline Data

**Abstract:**

This project summarised and analysed spatial information on grizzly bear mortality in the Babine watershed based on compulsory inspections and problem wildlife occurrence databases and previous reports. It also summarised the status of current bear awareness education based on a survey of available information and interviews.

Since 1990, 59 grizzly bears are known to have been killed through the legal hunt (47), illegal hunt (6) and as problem wildlife (6). Mortality was evenly split between males and females. There is no estimate of the number of bears killed by the legal First Nations harvest or following human/bear conflicts on First Nations lands. The spatial distribution of mortality is related to guide outfitter territories, human settlements and road access.

Human/bear conflict resulting in a problem wildlife occurrence report was most common around Fort Babine and the DFO fish fence due to the availability of domestic anthropogenic attractants and the availability of fish pooled at the weir.

The data suggest a high mortality rate within Wildlife Management Unit 6-8, although these analyses are highly uncertain without better knowledge of the population within the entire grizzly bear population unit. There is potential for source-sink dynamics, with the weir drawing bears from a larger area, but study of the population at a broader scale is necessary to decrease uncertainty.

Access to educational messages was limited in the Babine watershed and varied by organisation. BC Parks staff received rigorous training, but it was unclear whether this information was passed on to park users because no permanent ranger worked in the park.

As well as collecting indicator data that will be useful in the short term, the study will provide a baseline for future studies examining the effectiveness of management activities.

**Status:** Approved in principle in 2009. Modified in 2011. Completed in 2012.

**Geographic scope:** BWMT area plus area beyond to include home range of adult female grizzly bears using the BWMT area.

**Objectives listed in land-use plans:** The entire plan area has objectives to minimise bear/human conflict. The Kispiox SRMP has a strategy for increased public bear awareness, and the Babine River Corridor MDS has a strategy to develop bear awareness and safety information and guidelines.

**Type of monitoring:** Collecting baseline data for effectiveness monitoring

**Contractor:** Lana Ciarniello, Aklak Wildlife Consulting

**Funding:** $10,000 (before HST)

**Consequence for knowledge base:** This project collected baseline data to examine the potential effectiveness of education on reducing human/grizzly bear interactions. The study confirms that mortality is associated with roads and settlements.

**Consequence for management:** This project will enable better management decisions to be made, through appropriate processes which are separate from the BWMT, by suggesting data-collection details required for better analyses of the effectiveness of management activities. In particular, it focuses on the necessity of monitoring the entire grizzly bear population unit to determine mortality. It also suggests the need for consistent bear education messages.

## Project 2010-2: Recreation Opportunity Spectrum

**Abstract:**

This project collected indicator data on recreation opportunities in the Babine watershed. Recreation Opportunity Spectrum (ROS) mapping is a method of looking at the landscape to determine what types of recreational experiences are being provided over a landbase in terms of remoteness, naturalness and expected social experience. Recreation opportunity categories in the Babine Watershed included *Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural* and *Roaded Modified.* A map of the road network in the area, interviews with people familiar with recreation in the area and past ROS mapping were used in the mapping process.

Recreational features in the Babine watershed include alpine areas, lakes and waterways, with some facilities and trails present to service these features. Recreational activities in the watershed include: angling, hiking, hunting, camping, snowmobiling, all terrain vehicle travel, skiing, rafting, kayaking, jet-boating, botanical forest product harvesting, and wildlife viewing. Some of these activities, such as angling, are concentrated mostly on one feature – the Babine River, while others, such as snowmobiling are dispersed over much of the watershed.

Five ROS Classes were mapped in the Babine Watershed. Areas that are essentially non-motorized cover 61% of the watershed, being in the *Primitive* or *Semi-primitive Non-motorised* classes (Table 1). The *Roaded Modified* class covers the second largest area in the watershed, covering all areas where forest harvesting has occurred. *Semi-primitive Motorized* areas are few due to the difficulty of traveling in non-roaded areas with motorized vehicles, and the relatively low levels of motorized use in this remote area.

**Table 1. Portion of Babine Watershed in each Recreation Opportunity Spectrum class.**

| ROS class | Area (ha) | % of total area |
|---|---|---|
| Primitive | 107,535 | 26.8 |
| Semi-primitive non-motorized | 128,878 | 32.1 |
| Semi-primitive motorized | 38,984 | 9.7 |
| Roaded natural | 6,818 | 1.7 |
| Roaded modified | 119,718 | 29.8 |

Lakes in the watershed occurred in most ROS classes, with eleven lakes being in the Primitive class, nine in the Roaded modified class, four in the Semi-primitive non-motorized class and one in the Semi-primitive motorized class. Most of the Babine River is in the Semi-primitive motorized class, due to use by jet-boats.

Most alpine areas are in the Semi-primitive non-motorized class due to the proximity of roads, though significant portions of the alpine in the north are in the Primitive class. Some alpine areas in the Primitive and Semi-primitive non-motorized classes will have some motorized use, especially from snowmobiles, but their remoteness means motorized usage will be light enough to justify these non-motorized classes.

The land management plans covering the Babine Watershed give direction to implement several access control points to protect wilderness values and tourism, and grizzly bears. Some of these access control points have not been implemented or are ineffective in controlling access as intended. The lack of plan implementation or ineffectiveness of measures in the plan should be rectified so that recreational values are not compromised.

**Status:** Completed March 31, 2011.

**Geographic scope:** Babine watershed.

**Objectives listed in land-use plans:** The Kispiox LRMP includes an objective to maintain primitive recreation opportunities. The SRMP and Nilkitkwa LUP specify areas intended to provide backcountry recreation opportunities. The Babine LUP and Kispiox LRM include an objective to maintain access to recreation destinations.

**Type of monitoring:** Collecting implementation data

**Contractors:** Adrian deGroot and Johanna Pfalz

**Funding:** $5,000 (before HST)

**Consequence for knowledge base:** This project determined that risk to recreation opportunities is currently low with some uncertainty in relation to lack of implementation or success of access control.

**Consequence for management:** This project found that primitive and semi-primitive recreation opportunities are well represented. Access to features has not been affected by industrial activity. One potential management issue is that the lack of plan implementation or ineffectiveness of measures may compromise recreational values. In particular, access control points at Sperry/Rosenthal 1, Shenismike West 2, Thomlinson Road 6 have not been implemented, the access control points at Nichyeskwa Connector 7 has been breached and Nilkitkwa 481 Road may have been breached.

## Project 2009-3: Grizzly Bear Habitat

**Abstract:**

This project will reduce uncertainty about maintenance of grizzly bear habitat due to the variety of different strategies applied in different management areas. The project will develop a database about grizzly bear habitat that is relevant to resource managers in Babine Watershed, analogous to the database for mountain goats created in 2008/9. The database will include grizzly bear management areas, high-value habitat, critical habitat, other habitat classes, harvested areas, forest cover, strategies implemented within and adjacent to habitat. This database will build on the access database created during project 2007-1 (Human/ Bear Interaction and Open Road Density) this year.

The project will also initiate development of effectiveness indicators looking at grizzly bear use of habitat. The variety of strategies implemented presents an excellent opportunity for an experiment: this project will consider potential designs for such a project (funding is beyond the scope of the BWMT).

**Status:** Initiated in 2009. Completed March 31, 2010. Awaiting final report and summary.

**Geographic scope:** Babine watershed.

**Objectives listed in land-use plans:** All land-use documents include objectives to maintain grizzly bear habitat.

**Type of monitoring:** Collecting implementation data

**Contractors:** Johanna Pfalz, Debbie Wellwood.

**Partners:** Bear biologists through the cumulative effects modelling process led by Debbie Wellwood and funded through other means.

**Funding:** $10,000 (before taxes)

**Consequence for knowledge base:** This project collected indicator data on grizzly bear habitat to facilitate risk analysis.

**Consequence for management:** This project will enable better management decisions to be made, through appropriate processes which are separate from the BWMT, by showing the level of risk and uncertainty associated with current protection of grizzly bear habitat. It may increase confidence in current activities, suggest further monitoring projects or lead to initiation of a plan-amendment process.

## Project 2008-5: Visual Quality in Babine River Corridor

**Abstract:**

This project investigated visual quality in the Babine River Corridor in collaboration with Glen Buhr, Ministry of Forests and Range. The project had three objectives: to compile existing mapping and photo information for established viewpoints along the Babine River Corridor, to update photo panoramas and to compare the effectiveness of quantitative (FREP protocol) and qualitative (stakeholder surveys) methods at determining whether Visual Quality Objectives have been achieved.

Panoramic photographs have been assembled from existing negatives and from new images for all 18 established viewpoints within the Babine Corridor. Because of the incised nature of the Babine River channel, only one viewpoint, Viewpoint 3, on the lower Babine River, has harvesting visible from the river. Viewpoint 3 has a Visual Quality Objective of "Partial Retention". The quantitative protocol measured an alteration of 12.7%, equating to a classification of "Moderate" (7.1 – 18% alteration). Field assessment, however, assigned a classification of "Partial Retention". Because the two methods disagree, the formal protocol defines the Effectiveness Evaluation for this Viewpoint as "Borderline".

Overall, risk to viewscapes in the upper and lower reaches of the Babine River is low due to the limitation of viewscapes to areas within the park. Risk in the middle reaches is greater as the river valley is wider and more open. To date, no harvesting is visible in the middle reaches. The Atna-Shelagyote Special Management Zone will provide protection to viewscapes in the middle reaches of the river on the north bank, but future harvesting may impact viewscapes elsewhere.

The public survey portion of the project was limited in success as only five people filled out forms despite wide advertising. Only one respondent provided comments about any viewscapes within the Babine River Corridor (though several commented about viewscapes along Nilkitkwa and Babine Lake (outside the BWMT area of interest). It is possible to conclude, however, that people do not have pressing concerns about visual quality at the current time.

**Status:** Initiated in 2008. Collaboration with MoFR. Completed 2011.

**Geographic scope:** Babine River Corridor.

**Objectives listed in land-use plans:** Both the Kispiox and Bulkley LRMPs include objectives for visual quality as well as objectives to maintain the visual elements of wilderness value along the Babine River Corridor.

**Type of monitoring:** Reducing uncertainty and detecting negative consequences.

**Contractors:** Ralph Kossman, Megan D'Arcy

**Partner:** Glen Buhr, Ministry of Forests and Range provided $12,000.

**Funding:** $5,000 (before taxes)

**Consequence for knowledge base:** This project has determined that there are currently no negative consequences in relation to visual quality as an element of wilderness value in Babine River Corridor. Unfortunately, due to the lack of Viewpoints with visible harvest, it was not able to reduce uncertainty about discrepancies between quantitative measures of visual quality and public perception.

**Consequence for management:** This project demonstrates that strategies are currently adequate to ensuring visual quality in the Babine River Corridor. There is no need to revisit visual quality objectives until harvesting increases in the middle reaches of the Babine River.

## Combined Project 2008-1 and 2008-2: Update Knowledge Base and Monitoring Priority Tables and Framework Manual and Extension

**Abstract:**

The first part of this project updated the Knowledge Base by including information gathered from all completed BWMT projects to 2010, investigating and incorporating existing information on landslides, and timber salvage, and consulting experts as necessary for new research and missing model variables. It also re-analysed risk and revised project priority tables for use during the 5-year monitoring period from 2010 – 2015.

The companion part of this project aimed to increase the number of people able to use the monitoring framework. It resulted in a short promotional description of the framework for use in fundraising, and a plain-language manual to complement the framework. In addition, a trainee worked on the update to learn about the framework.

The update was intended to include new objectives and strategies from a Park Management Plan that was being developed for the Babine River Corridor. However, the Park Management Plan process stalled, and due to new priorities, it will not be completed in the foreseeable future.

**Status:** Initiated in 2008 (first update since 2004). Completed by March 31, 2010.

**Geographic scope:** Babine watershed

**Objectives listed in land-use plans:** All objectives and strategies.

**Type of monitoring:** All types of monitoring.

**Project team:** Karen Price, Dave Daust, Liz Osborn, Megan D'Arcy, Jeff Anderson

**Funding:** $12,000 (2008-1) + $5,000 (2008-2) for a total of $17,000 (before taxes) budgeted; $2,306.25 returned to operating fund due to lack of new objectives from park plan.

**Consequence for knowledge base:** This project updated the knowledge base and priority tables. It will facilitate monitoring decisions for 2010-2015 and beyond. A plain-language manual will assist communication with potential funding sources.

**Consequence for management:** This project fed back information into the Knowledge Base and highlighted information to be passed on to bodies responsible for management decisions through appropriate processes.

# Appendix 3: Objectives and Indicators Lacking Targets

This assessment, updated October 5, 2011, is based on the Babine Watershed Monitoring Trust's Knowledge Base and Priority Tables which were updated in early 2010. These tables consider all objectives and strategies listed in the land-use plans that apply to the Babine Watershed.

| ***Objective*** | ***Indicator*** | ***Notes*** | ***Land-use Plans*** |
|---|---|---|---|
| **Maintain biodiversity** | | | |
| Maintain natural seral-stage distribution of ecosystems | % old forest by BEC variant | The indicator allows for high uncertainty (BHLP says "*maintain biodiversity by maintaining a natural seral-stage distribution*", but Table 1 targets will likely not lead to a "*natural seral-stage distribution*". Targets need to be defined by productivity class within BEC variant to reduce uncertainty in future estimates (see BWMT project 2007-4P). | BHLP Table 1<br>SRMP Table 2; |
| Maintain connectivity in landscape corridors | % mature and old forest within corridors | No specific target in the Bulkley ("*most of the structure and function associated with old forest...*" BHLP); though LRMP lists target of 70% existing structure and function. (70% in Kispiox) | BHLP 1.3a<br>LRMP 2.3.1.2<br>SRMP Table 2 |
| Maintain connectivity in landscape corridors | % winter harvest in corridors | No target in Bulkley (100% in Kispiox) | Not in BHLP (or LUPs or LRMP)<br>SRMP Table 2 |
| Maintain deciduous ecosystems | % of natural deciduous-leading ecosystems | No targets ("*diversity of...deciduous species representing the natural species composition for each ...subzone*" BHLP); LUPs ("*retain a portion of these species...*"); no target in Kispiox | BHLP 1.4a<br>LUP 1.6.4<br>SRMP 3.1.1.2 |
| Maintain sensitive riparian areas | % alteration to fluvial ecosystems | Bulkley has no target for alteration beyond FRPA. FRPA targets for riparian reserve and management zones do not reflect the extent of fluvial ecosystems. (No alteration in Kispiox). | Not in BHLP<br>SRMP Table 2 |
| Attain natural landscape pattern | % of area in each patch-size class (logged in Kispiox; nearing rotation age in Bulkley) | Current targets are unrelated to objective (see BWMT project 2007-4P). Targets should be expressed as patch size distribution of mature and old forest rather than distribution of harvested or young forest. Total amount of mature or old forest is the best indictor; patch size distribution has limited predictive power (see project 2007-4P). | Not in BHLP<br>LUPs 1.5 Table 5<br>SRMP Table 2 |
| Maintain stand structure | Wildlife tree patches and | Current targets are not related to natural amounts (see project 2005-5P | BHLP Table 2<br>SRMP Table 5 |

| | | | |
|---|---|---|---|
| | attributes | for natural amounts in the Babine) and are below levels that provide benefits to biodiversity. Concept in LRMP (closer to natural is more likely to maintain biodiversity) is lost in LUPs (and BHLP). "*Maintain the range of structural attributes of old forests...*" SRMP Table 2 is not consistent with Table 5. | |
| **Maintain grizzly bears** | | | |
| Reduce human/bear interaction | Open road density | This is the best indicator of human/bear interaction. No targets beyond Hanawald and Shedin (Kispiox). BWMT project 2007-1 shows that some sub-basins are already approaching high-risk threshold. BHLP does not provide target and provides no direction for roads in high-value habitat: ("*limit road development...within moderate-value grizzly bear habitat*"; "*avoid human-bear conflicts in high-value grizzly bear habitat*") | BHLP 2.5c (for moderate-value habitat); 2.5d SRMP |
| Reduce human/bear interaction | Initiation of education programmes | No targets (objective only exists in Kispiox) | Not in BHLP SRMP |
| Reduce human/bear interaction | % of road with screening | No targets in BHLP; in Babine SMZ in BLUP; No target in Kispiox | Not in BHLP BLUP 4.1 |
| **Maintain mountain goats** | | | |
| Maintain goat populations | Road density < 1km of identified habitat | No target for Kispiox (not in BHLP) | Not in BHLP No direction in SRMP—notes that LRMP direction could result in future guidelines (3.1.2.3) |
| | % harvest during natal period < 200m from habitat | No target for Kispiox (BHLP "*provide security...by limiting disturbance*") | BHLP 2.3b very vague. No direction in SRMP—notes that LRMP direction could result in future guidelines (3.1.2.3) |
| **Maintain fish habitat and populations** | | | |
| Maintain bull trout | % habitat protected | No target in Bulkley. See BWMT project 2008-4 for assessment of critical and important habitat. SRMP has single target of no permanent | Not in BHLP SRMP Table 8 |

| | | | |
|---|---|---|---|
| | | bridge near staging areas. | |
| Maintain steelhead | Repeated capture | No target for park | Park MDS |
| **Water** | | | |
| Maintain water flow | ECA % | No targets in Bulkley (changing provincial regulations mean that not all watersheds are subject to assessment); (SRMP has triggers for overview) | Not in BHLP SRMP Table 10 |
| Maintain water quality | Landslides resulting from management | No target for Bulkley (SRMP target = 0) | Not in BHLP SRMP Table 9 |
| Maintain water quality | Sediment from road crossings | No targets for Bulkley (SRMP target = low risk at specified crossings) | Not in BHLP SRMP Table 9 |
| Maintain water quality | Planning | No targets for Bulkley (SRMP target = development of listed plans) | Not in BHLP SRMP Table 9 |
| **Timber** | | | |
| Promote rapid timber growth | % old slow-growing stands | No targets | Not in BHLP |
| Minimise unsalvaged timber mortality | % of insect and disease damage controlled | No targets | Not in BHLP |
| Minimise unsalvaged timber mortality | % of natural mortality salvaged | No targets | Not in BHLP |
| Increase yield in enhanced timber development areas | % of ETDA thinned and pruned | No targets | BHLP 4.1a |
| Increase yield in enhanced timber development areas | % of ETDA commercially thinned | No targets | BHLP 4.1a |
| Increase yield in enhanced timber development areas | % of ETDA with improved stock | No targets | BHLP 4.1a |
| **Maintain opportunities for tourism and recreation** | | | |
| Maintain backcountry opportunities | % backcountry in primitive state | No targets ("*maintain...diverse range of...opportunities*" BHLP); Atna-Shelagyote SMZ in SRMP, but no overall targets. | BHLP 5.1a SRMP Table 13 |
| Maintain access to recreational opportunities | # of inaccessible destinations | No target in Kispiox (BHLP: "*maintain reasonable access*") | BHLP 5.2a |
| **Maintain and use botanical forest products** | | | |
| Maintain or enhance productivity of berry habitat within berry management areas | % soil and vegetation disturbance | No target in Kispiox (objective only pertains to Kispiox) | SRMP Table 18 |

# Appendix 4: Abbreviations

BRC .....Babine River Corridor
BWMT ..... Babine Watershed Monitoring Trust
CFS.....Canadian Forest Service
DFO ..... Department of Fisheries and Oceans
ECA .....Equivalent Clearcut Area
ETD ..... Enhanced Timber Development Zones
FREP..... Forest Resources Evaluation Program
FRPA..... British Columbia Forest and Range Practices Act
FSP ..... Forest Sciences Program
GIS .....Geographic Information System
LRMP ..... Land and Resource Management Plan
LUP..... Landscape Unit Plan
MoE .....Ministry of Environment
MFLNRO .... Ministry of Forests, Lands and Nat. Res. Ops.
MDS.....Management Direction Statement
PEM .....Predictive Ecosystem Mapping
SFM Network..... Sustainable Forest Management Network
SRMP..... Sustainable Resource Management Plan
VRI.....Vegetation Resources Inventory